ISE Initiative Integration and Operations

Industry/Academia Workshop
October 28-29, 1999

Brantley R. Hanks, NASA Langley Research Center
ISE Special Assistant for Framework and Metrics
b.r.hanks@larc.nasa.gov

ISE Initiative Integration and Operations

Intelligent Synthesis Environment Industry/Academia Workshop

- External Coordination and Partnering
- Information Technology Integration
- Science and Engineering Integration
- Integrated Technical Performance Measurement
- Contracting/Acquisition

External Coordination and Partnering

Independent NRC Study on Advanced Engineering Environments

Intelligent Synthesis Environment Industry/Academia Workshop

- **Sponsored by NASA's Chief Engineer and Chief Technologist**
- **A two-phase study to assess the current and future national context within which NASA's Advanced Engineering Environments (AEE - the NRC's term for ISE) plans must fit.**
  - Phase 1 (July 1998 - July 1999) focused on the near term (next 5 years)
  - Phase 2 (July 1999 - July 2000) focuses on far term (5-15 years)
- **Team membership consisted of experts from industry, academia and non-profit research organizations**
- **Phase 1 Tasks**
  - Assess NASA's long-term vision for Advanced Engineering Environments in context with other U.S. Government agencies, industry and academia's visions and current advanced engineering environments
  - Identify potential payoffs of NASA's vision and barriers to achieving the vision
  - Recommend an approach for NASA to enable development of a state-of-the-art engineering environment capability

NRC Advanced Engineering Environments Study Recommendation

NASA should:

- Take the lead and establish a partnership of government, industry, and academia to foster the development of AEE Technologies
- Establish a "center-of-gravity" for the development of ISE technologies
- Define an agency-wide plan for the development and implementation of comprehensive improved engineering processes, practices, and technologies
- Essential that ISE technologies be developed by leveraging off of the resources being invested in Advanced Engineering Environments for OGA's, Industry, and Academia requirements

Note: Phase 1 Study Report can be found at: http://www.nap.edu/catalog/9597.html

Workshops/Reviews Related to ISE

Intelligent Synthesis Environment Industry/Academia Workshop

- **Human Computer Interaction and Virtual Environments, April 26-27, 1995 (NASA CP-3320, Dec. 1995)**
- **Computational Intelligence and Its Impact on Future High Performance Engineering Systems, June 27-28, 1995 (NASA CP-3323, Jan. 1966)**
- **Training Seminar on Computational Intelligence, March 6-7, 1996**
- **Computational Tools and Facilities for Next Generation Analysis and Design Environment, Sept. 17-18, 1996 (CP-3346, March 1997)**
- **Next Generation CAD/CAM/CAE Systems, March 18-19, 1997 (NASA CP-3357, Sept. 1997)**
- **Collaborative Engineering Environments Planning Workshop, March 25-27, 1998**
- **Collaborative Engineering Environments Planning Workshop, June 6, 1998**

Workshops/Reviews Related to ISE(cont'd)

Intelligent Synthesis Environment Industry/Academia Workshop

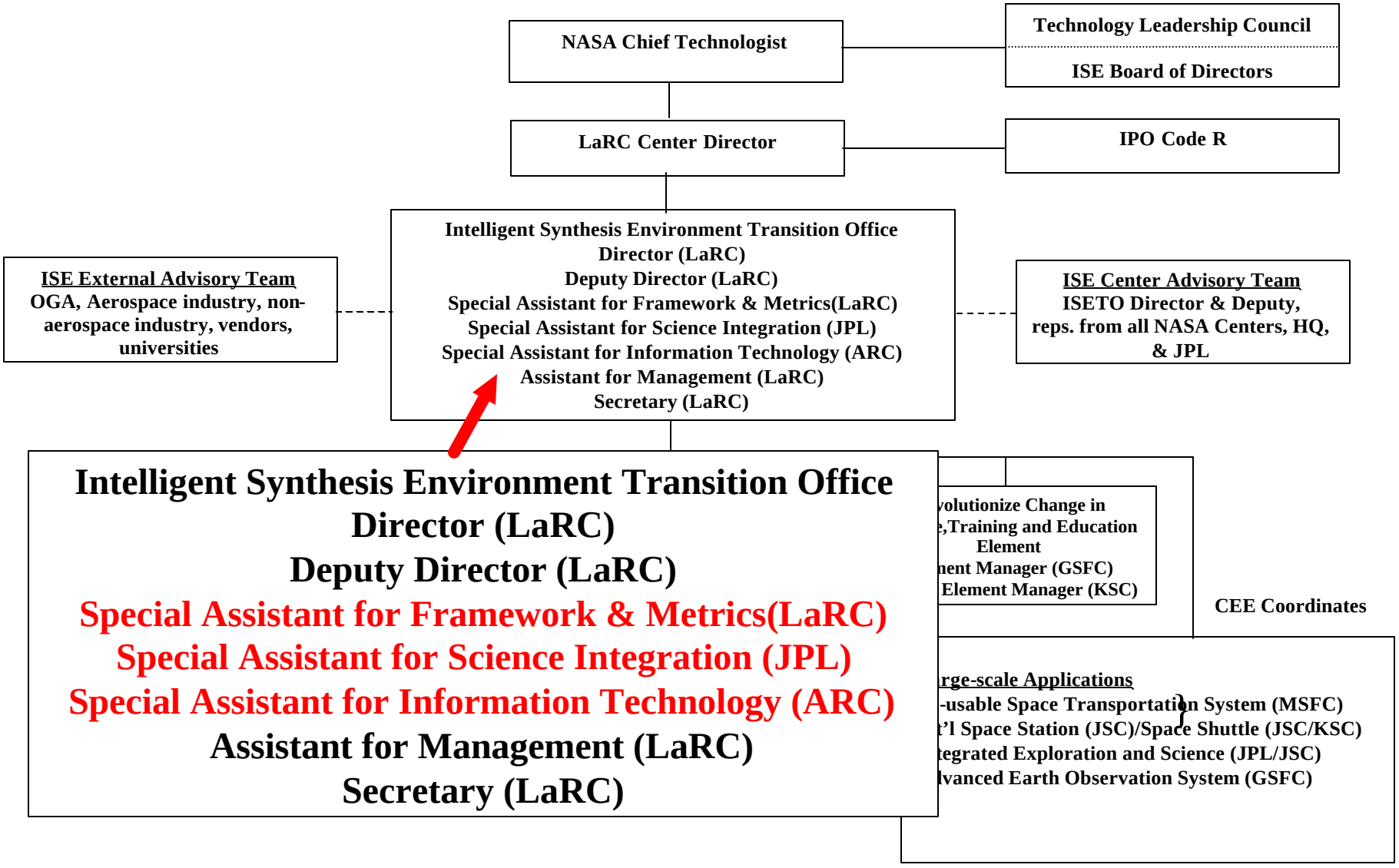
- **Advanced Technology for Engineering Education and Training, Feb. 24-25, 1998 (NASA CP-1998-208442, July 1998)**
- **Intelligent Agents and Their Potential for Future Design and Synthesis Environment, Sept. 16-17, 1998 (NASA CP-1999-208986, Feb. 1999)**
- **Agency ISE Workshop, Feb. 24-26, 1999**
- **Various ISE Initiative Element Mini-Workshops, Feb. - Aug. 1999**
- **Advanced Training Technologies and Learning Environments, March 9-10, 1999 (NASA CP-1999-209339)**
- **ISE NASA/Other Government Agency Workshop, June 22-23, 1999**
- **Advanced Group Support Systems and Facilities, July 19-20, 1999**
- **Non-Advocate Review, Aug. 18-20, 1999**
- **NASA/Industry/University Workshop, Oct. 6-7, 1999**

Other Government Agencies Consulted in ISE Formulation Phase

- Air Force Research Laboratory
- Applied Physics Laboratory
- Army Research Laboratory
- Defense Advanced Research Projects Agency (DARPA)
- Department Of Energy
- National Institute of Standards and Technology
- National Science Foundation
- Office of Naval Research
- Wright Patterson, AFB

ISE Management Structure

Intelligent Synthesis Environment Industry/Academia Workshop



ISE Integration with IT Programs

Dr. David J. Korsmeyer, NASA Ames Research Center

ISE Special Assistant for Information Technology

dkorsmeyer@arc.nasa.gov

Role of the Special Assistant for IT

- **Coordination between the ISE Program's IT components and**
  - other NASA IT-focussed programs
  - other Gov't IT-focussed programs
  - NASA CIO community
- **Resource for IT research and information for the ISE elements**

Other NASA IT Programs

- **IT Base**
- **HPCC**
- **IS (Intelligent Systems)**
- **Code S / 632 x-cutting tech**
- **CIO community**

And other Programs with Large IT elements,

- **Aviation Safety & Aviation Operations**
- **etc…**

Joint Meetings have occurred between the ISE and several IT program managers.

Other Government IT Programs

- **DARPA**
- **DoD**
  - AFRL, ONR, etc
- **DOE**
- **NIST**
- **NSF**
- **etc...**

First ISE Other Gov't Agencies' Workshop, June 23-24, 1999

Technology Readiness Levels

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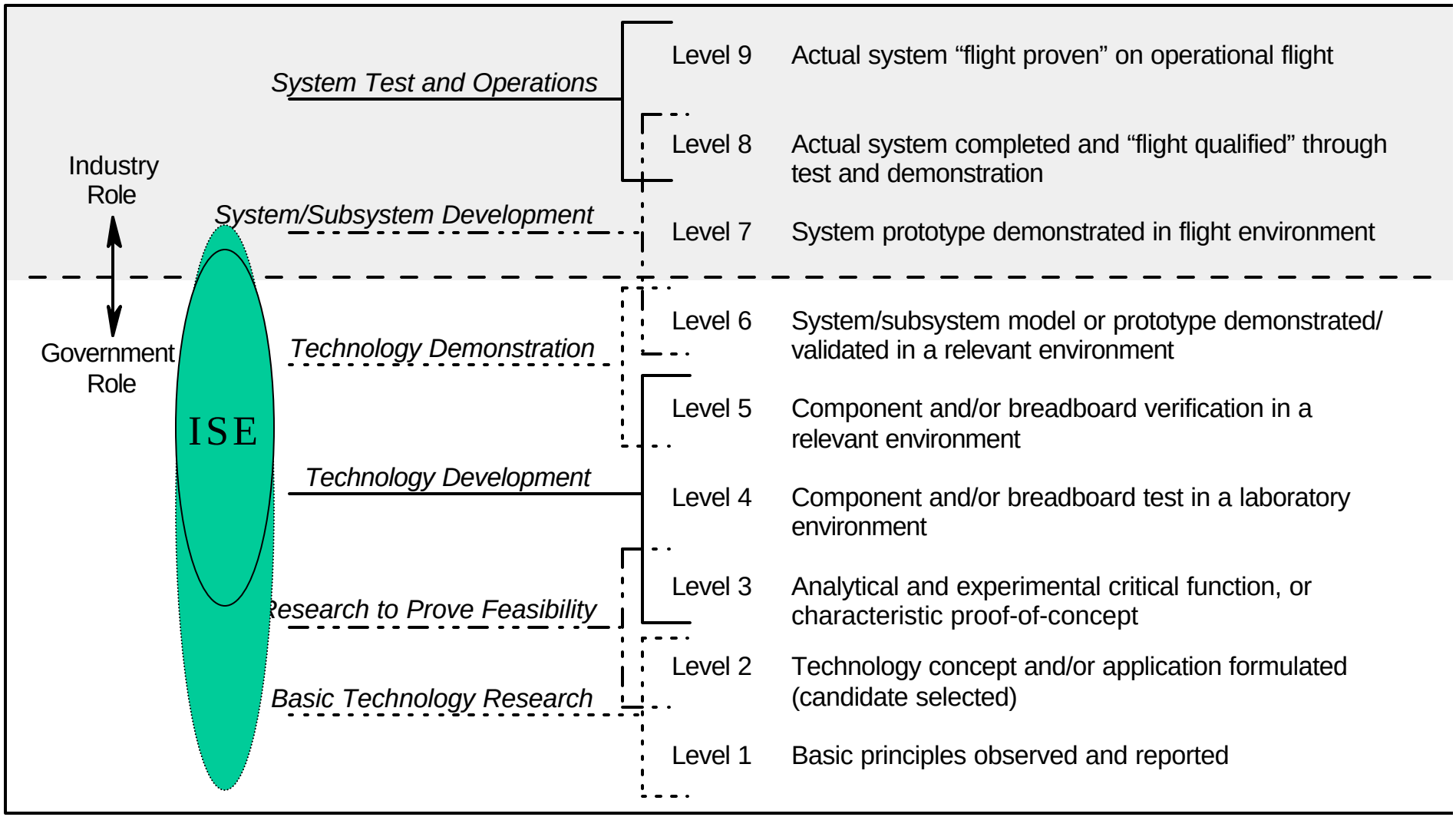
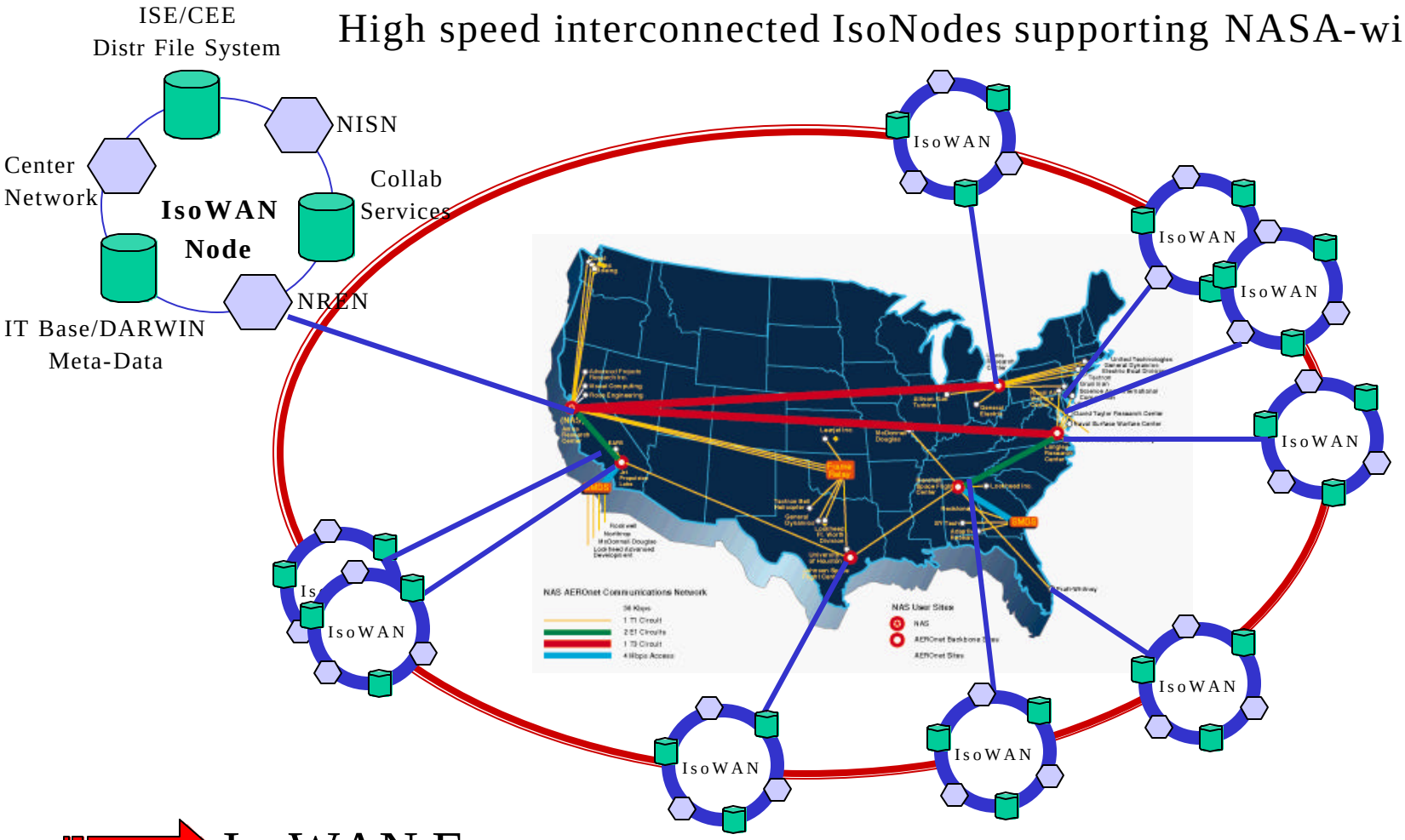


NASA's IsoWAN Forum

Intelligent Synthesis Environment Industry/Academia Workshop

High speed interconnected IsoNodes supporting NASA-wide services



IsoWAN Forum

A Joint Technical Initiative between ISE/CEE, and IT Base, HPCC, NREN/NGI, NISN, CIO's - IsoWAN Workshop 7/20-22/1999

Integration with Others (NASA Programs & Agencies)

- **MOU's and MOA's between the various NASA Enterprises and other Gov't agencies**
  - IsoWAN MOA in draft (ISE/CEE, IT B ase, NISN, NREN)

- **IT Coordination Mtg, July 19, 1999**
  - Betsy Edwards - Code R CIO, and IT Base, HPCC, COSMO, IS, ISE
  - 2nd mtg planned for the Fall '00

- **Identify NASA Missions for Joint Support**
  - RSTS, ISS, AEOS, Exploration
  - Etc...

Science and Engineering Integration

Dr. John Peterson, Jet Propulsion Laboratory

ISE Special Assistant for Science Integration

john.peterson@jpl.nasa.gov

Role of the Special Assistant for Science Integration

Intelligent Synthesis Environment Industry/Academia Workshop

- **To facilitate and enable cooperation between the ISE Initiative components and**
  - NASA science communities
  - External ISE related programs
    - Other Government Agencies
    - Universities
    - Conferences & Societies
    - Industry, both technology vendors and users
- **ISE Initiative Office resource for**
  - Science needs and product assessments
  - External engineering & problem-solving tools and environments
    - Knowledgeable of both research activities and available products

Integration Concept

Integration Methodologies

Intelligent Synthesis Environment Industry/Academia Workshop

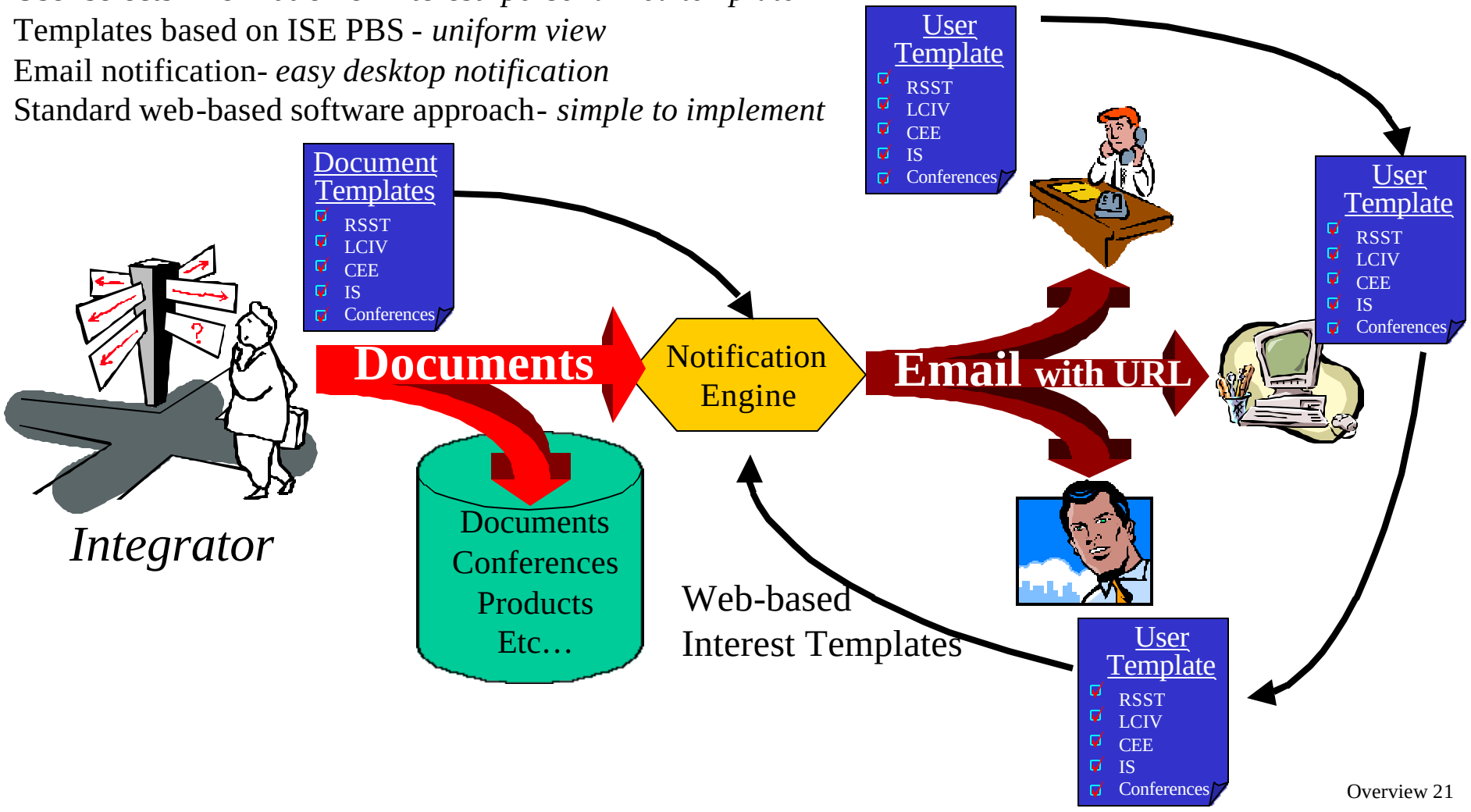
- **Facilitate and enable regular strategic and programmatic community meetings for ISE implementation**
  - ISE Science Team
  - External Advisory Committee (OGAs, Industry & Universities)
  - Advanced Engineering Environments (AEE) Workshop
  - ISE sessions within established Conferences
- **Additional miscellaneous activities**
  - Visits and assessment reports of external ISE related programs
  - Committee member for societies & conferences with AEE focus
  - Generate science requirements and product assessment surveys & reports
- **Integrated web document repository**
  - Information warehouse for external ISE related activities and products
    - Populate database with lists and documents
    - Lists and documents available by topics, products & search engine
    - Updates available by user interest templates with email notification

Integrated Web Document Repository

Intelligent Synthesis Environment Industry/Academia Workshop

Approach Based on the LaRC Livelink Publicly Accessible System

- Web-based information access- *easy desktop access*
- User selects information of interest- *personalized template*
- Templates based on ISE PBS - *uniform view*
- Email notification- *easy desktop notification*
- Standard web-based software approach- *simple to implement*



ISE – Integrating Science and External Programs

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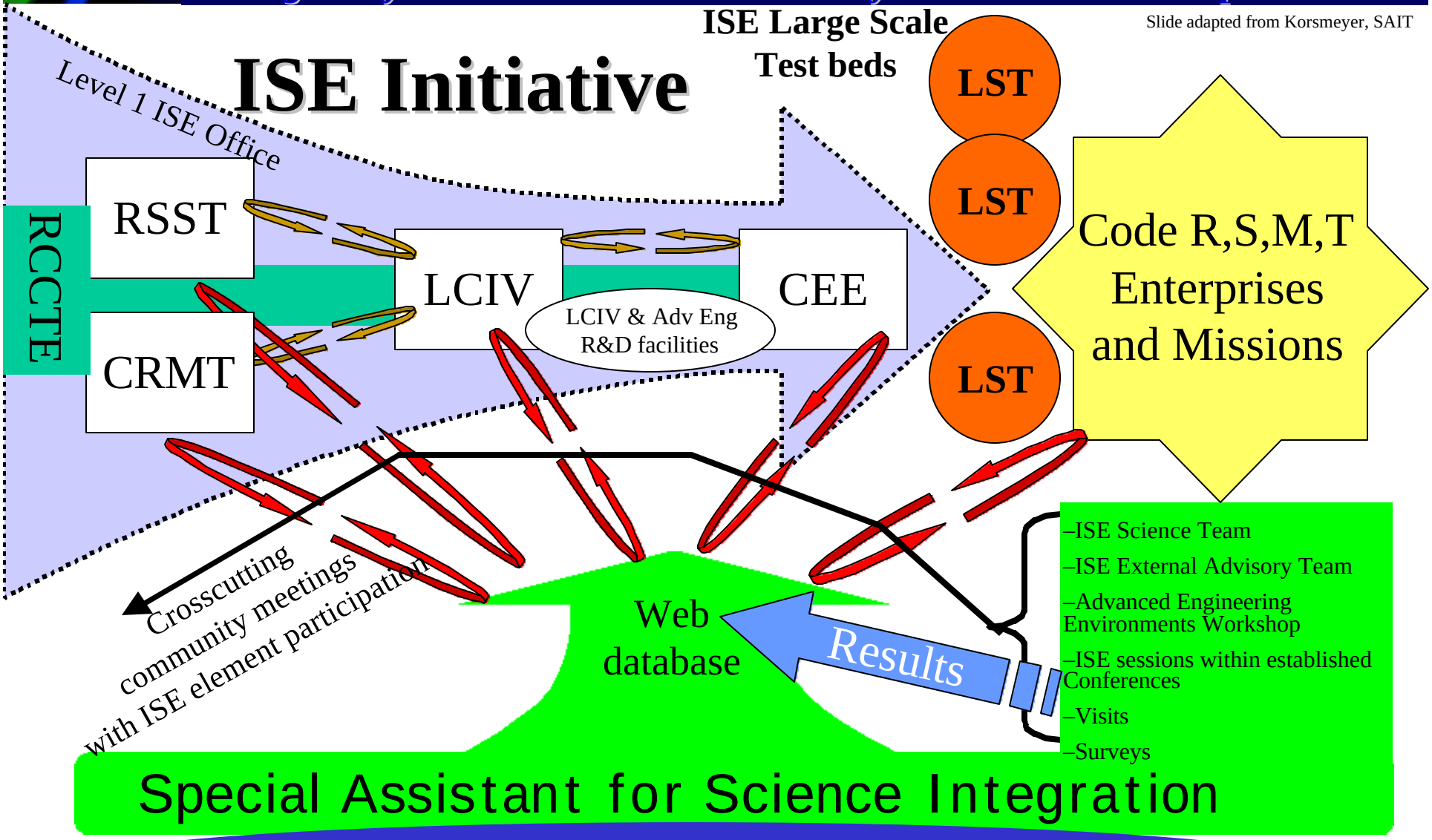
Slide adapted from Korsmeyer, SAIT



Science Survey Web Page

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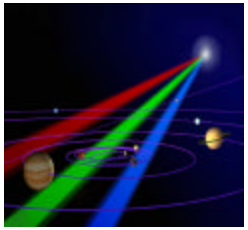
ISE Performance Measurement Technology

Brantley R. Hanks, NASA Langley Research Center
ISE Special Assistant for Framework and Metrics
b.r.hanks@larc.nasa.gov

NRC Study on Advanced Engineering Environments, June 1999 - Excerpt from "Barriers" Section

"Culture, Management, and Economics

- Difficulty of justifying a strong corporate commitment to implementing AEE technologies or systems because of their complexity and uncertainties regarding costs, metrics, and benefits
- Lack of practical metrics for determining the effectiveness of AEE technologies that have been implemented
- Unknowns concerning the total costs of implementing AEE technologies and systems and the return on investment
- Difficulty of securing funding to cover the often high initial and maintenance costs of new AEE technologies and systems in a cost-constrained environment
- Risk—and someone to assume the risk (management, system providers, or customers)
- Planning and timing issues-when to bring in the new and retire the old
- Difficulty of managing constant change as vendors continually upgrade AEE tools and other technologies
- Diversity of cultures among different units of the same company"



NASA's Engineering Framework

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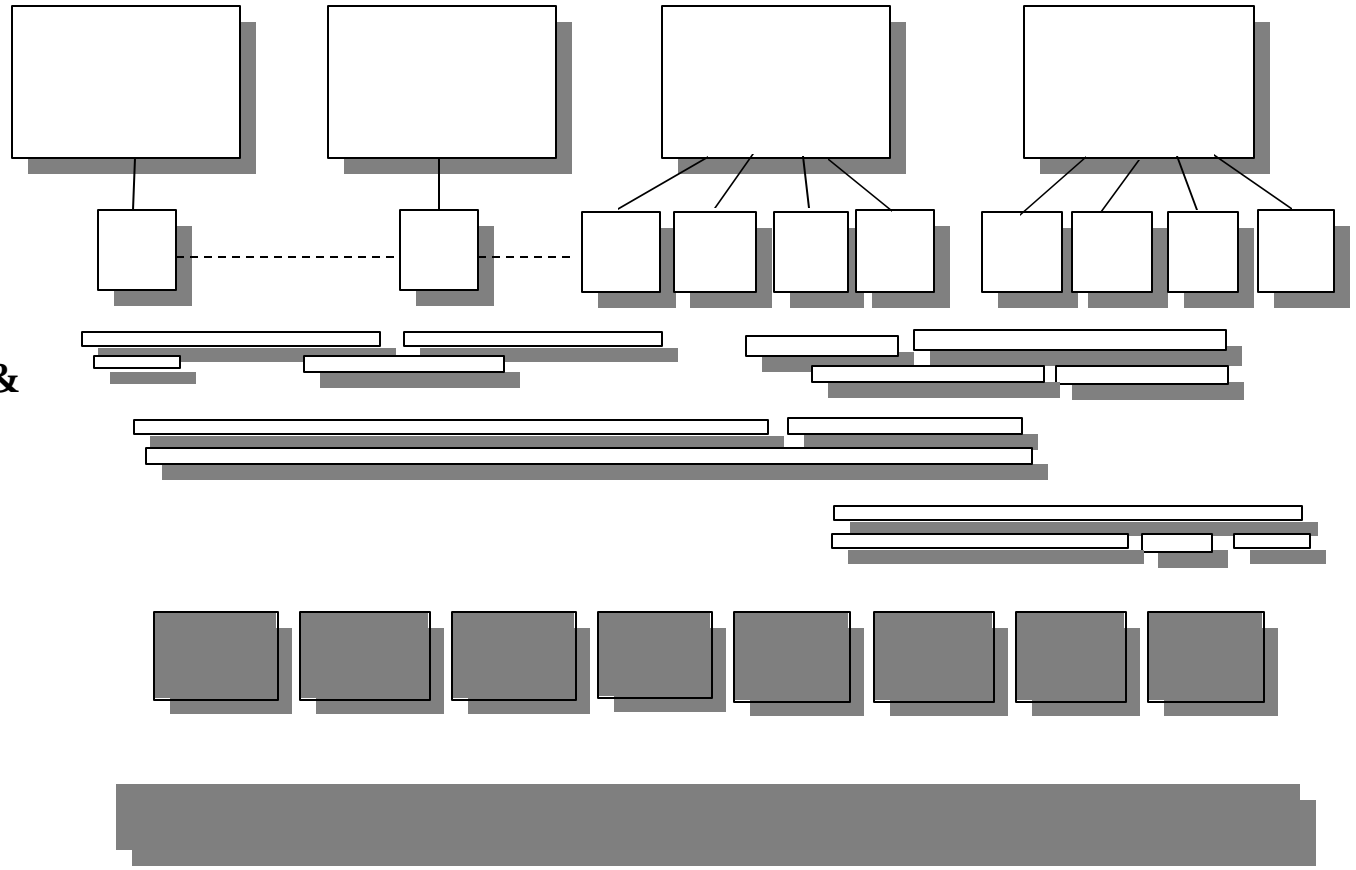
4 Enterprises (Mission Prioritization)

10 Field Centers (Engineering Management)

20-30 Major Programs & Projects (Engineering Tasking)

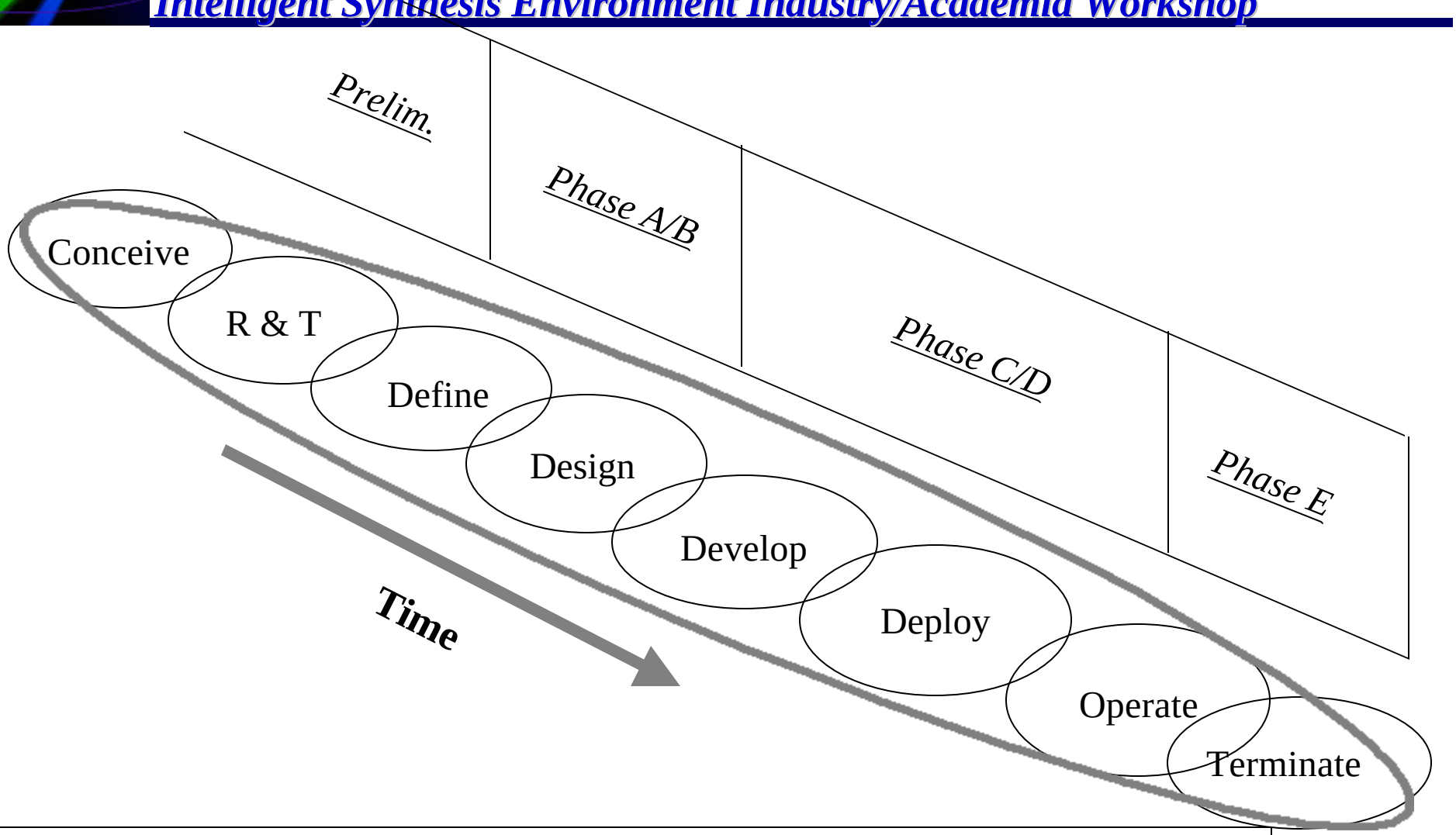
200-300-Plus Engineering Processes (Cost Accrual)

2000-3000-Plus Engineering Tools and Facilities (Capital Investment)



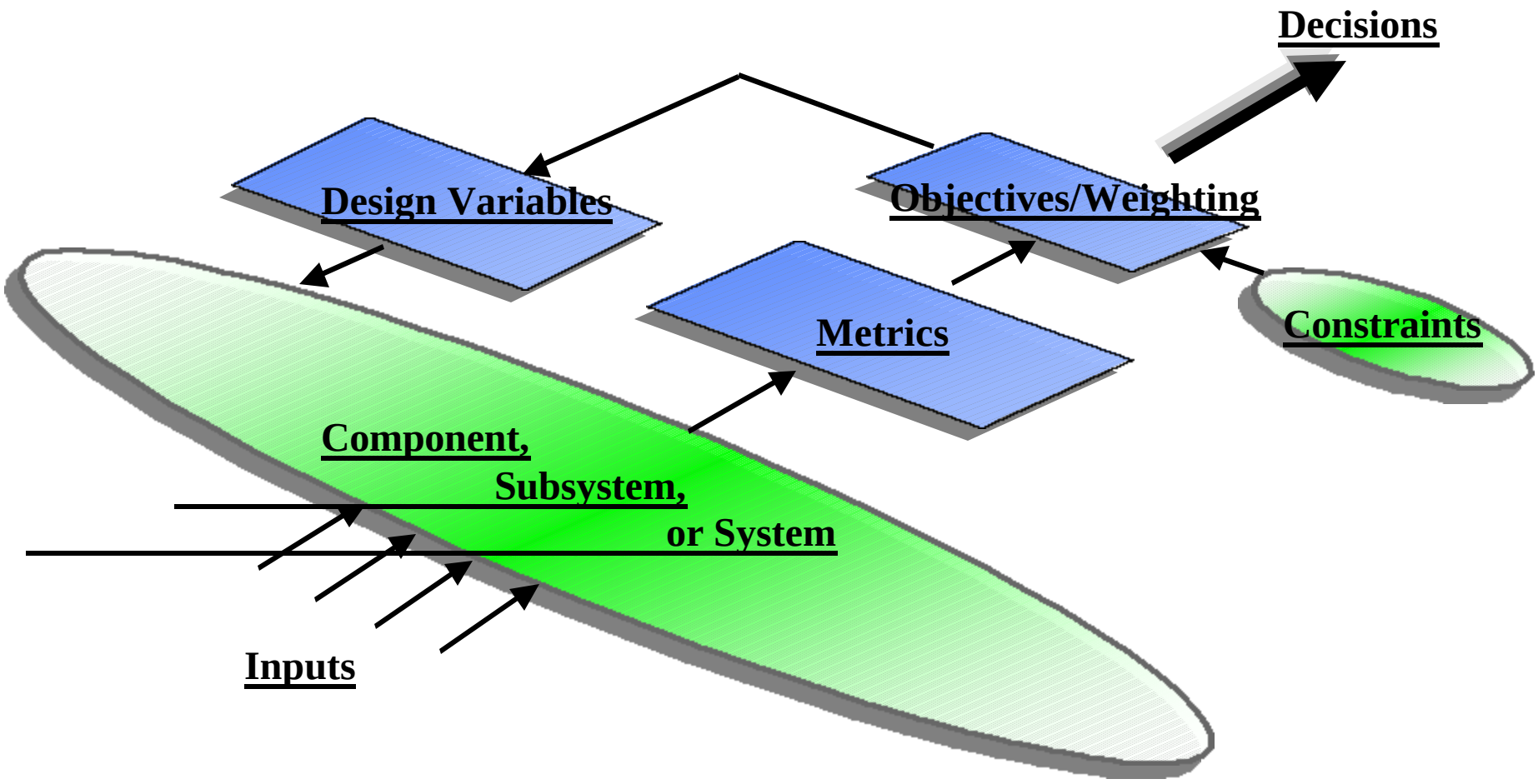
Challenge 1: How do we aggregate and evaluate payoffs on capital investments that address the needs of many diverse missions?

NASA Mission Sequence



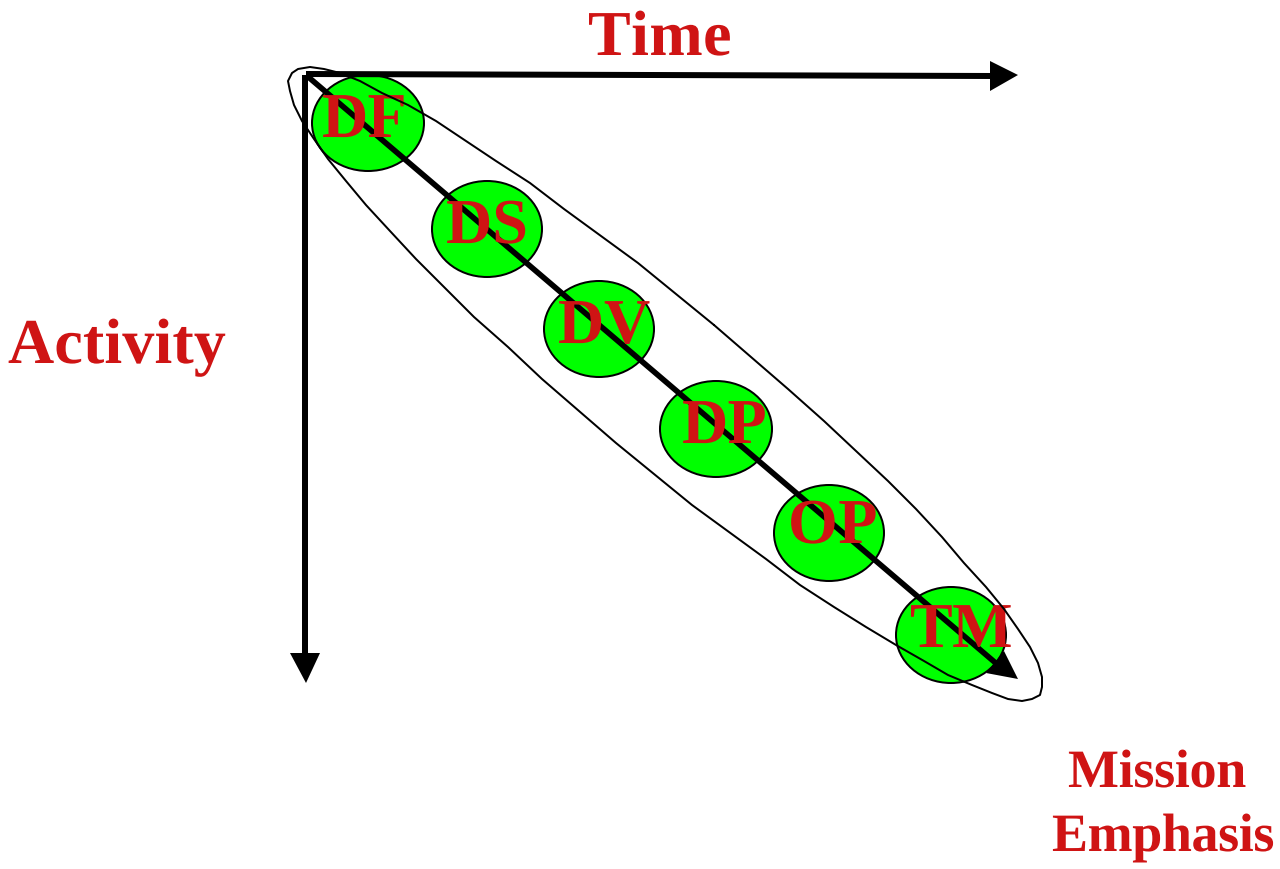
Challenge 2: How do we prioritize investments across the broad spectrum of possible tools and methods used in a mission life cycle?

Integrated Design

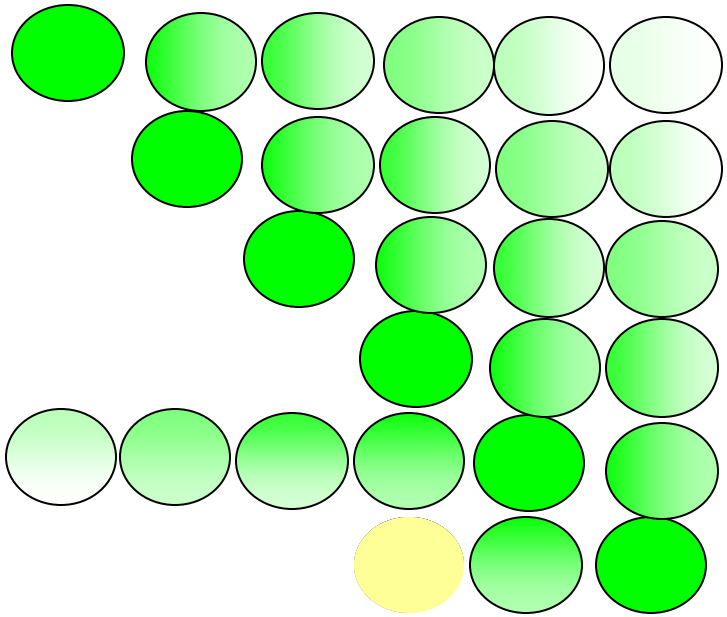


Challenge 3: How do we conduct design trades when the system to be designed is a mission life cycle ?

A Mission Life-Cycle Model Matrix Format



Extension to a Concurrent Engineering Framework

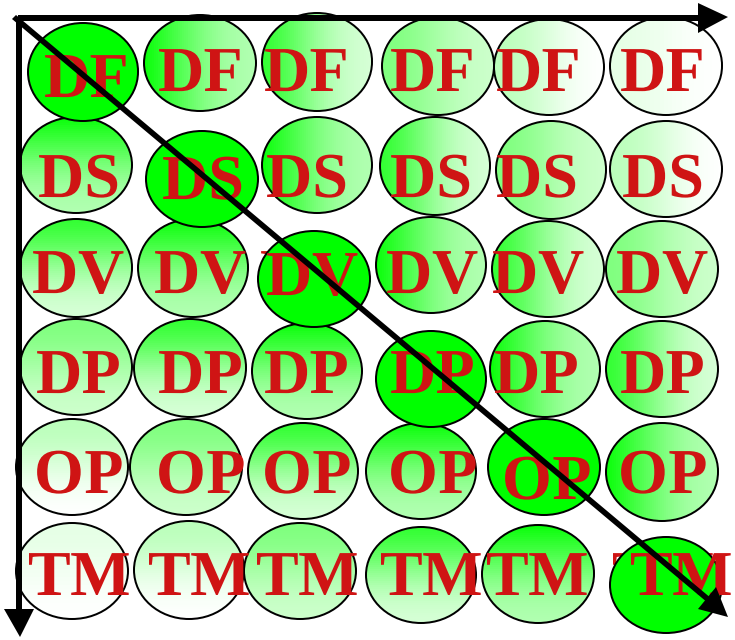


Example: Mission/Project Life-Cycle Cost (Simplified)

Cost per Unit Value

$= [$1 $2 $3 $4 $5 $6]

Value Metric per Unit Time



Time Required

t1
t2
t3
t4
t5
t6

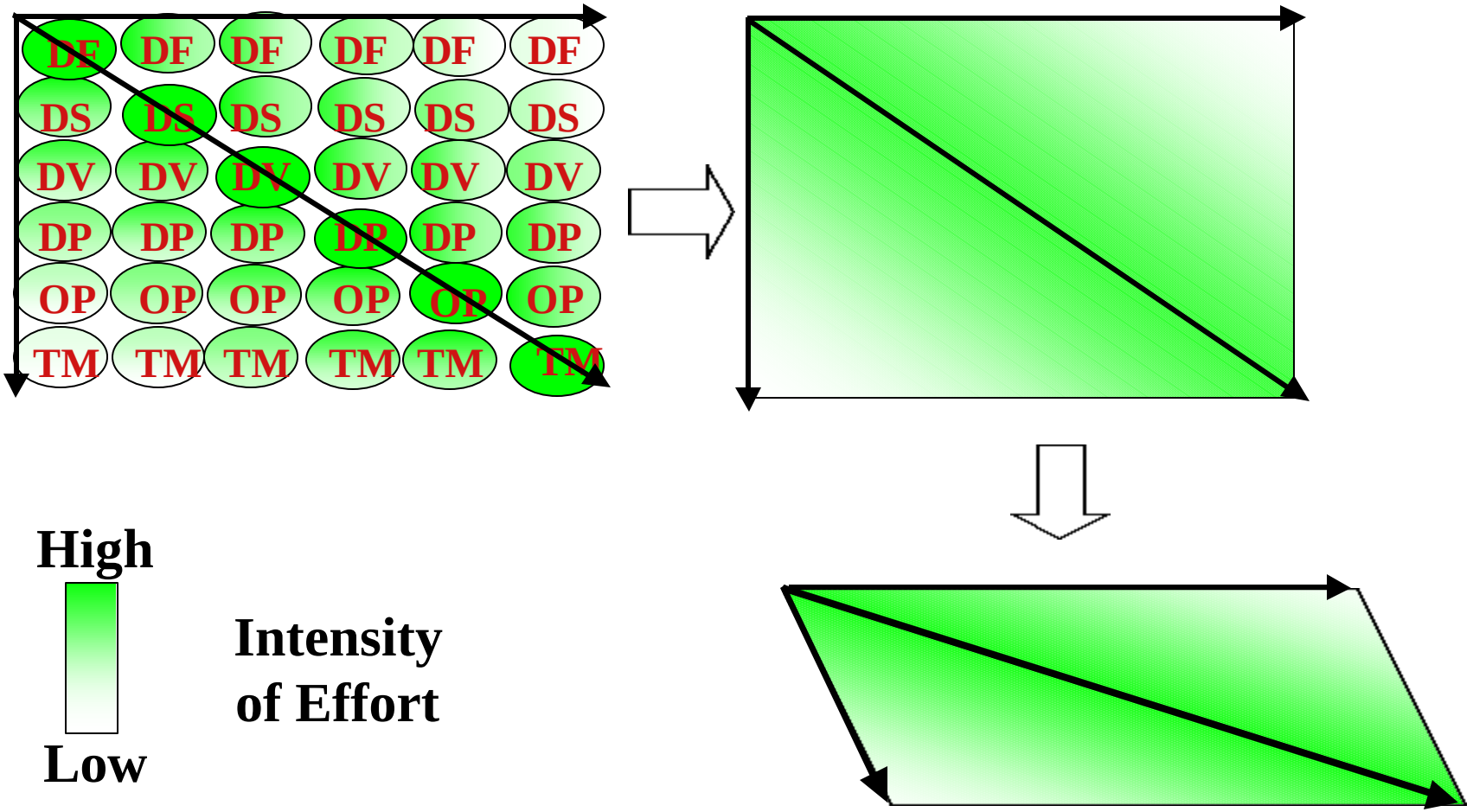
High

Low

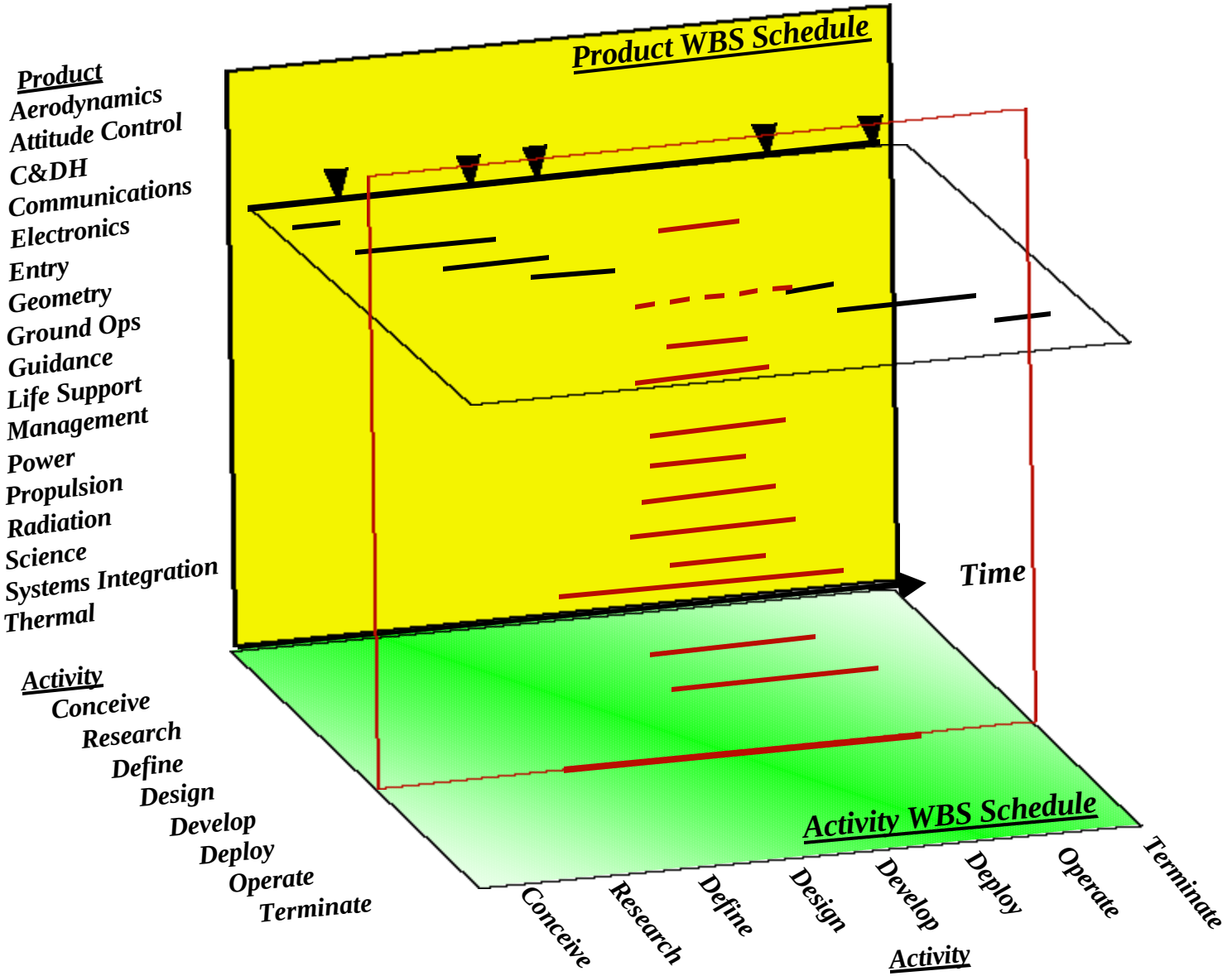
} Intensity of Effort

Value metrics can be assigned by work or by products

Activity-Based WBS

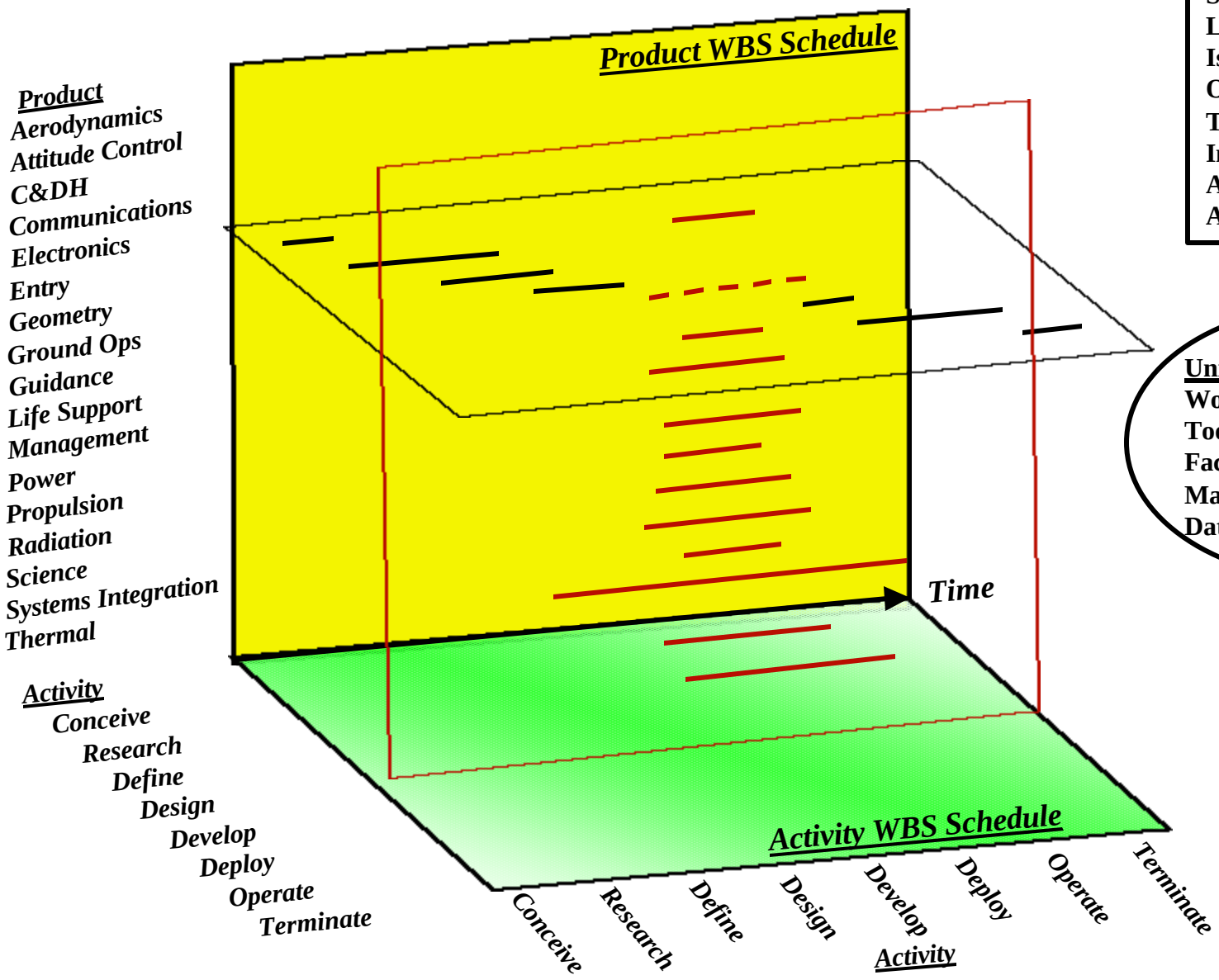


ISE Applications will Use a 3-D WBS Framework



ISE Applications will Use a 3-D WBS Framework

Intelligent Synthesis Environment Industry/Academia W



Sub-Products
Separation
Latching/Unlatching
Isolation/Protection
Operational Software
Thrusters
Instrument
Antenna
Avionics, etc

Universal Cost Elements
Work Units (incl. skill factor
Tools
Facilities/Equipment
Materials/Components
Data Bases

Sub-Activities
Draw
Analyze
Simulate
Optimize
Prototype
Test
Fabricate
Verify, etc.

Acquisition/Business

ISE Acquisition/Business Strategy

- **NASA will leverage off of external investments by establishing alliances**
  - Initiated activity with an Other Government Agency Workshop held in June, 1999
- **Implementation Tasks will be managed by the identified NASA center. The center will implement tasks by:**
  - Use existing contracts at the appropriate NASA centers
  - Use standard acquisition mechanisms available to NASA:
    - Indefinite Delivery Indefinite Quantity (IDIQ) contract
    - National Research Announcement to initiate process for cooperative arrangements
    - Request For Information
    - Requests For Proposals
    - Memorandum of Understanding
    - Space Act Agreements
    - Small Business and Innovative Research

Anticipated Procurement Strategies For ISE Support

- **Make Maximum Use of Existing Contracts for Supplies and Services (e.g., Information Technology Contracts through General Service Administrative (GSA), and Agency Contracts and Center Support Contracts for System Analyses and Engineering Support, etc.**

- **Indefinite Delivery , Indefinite Quantity Type (IDIQ) Contracts:**
  - Used for acquiring recurring supplies and services and when the precise quantity of supplies and services can not be predetermined
  - Contract must include a guaranteed minimum and specified maximum dollar amount
  - Contract Statement of Work describes the general scope; specific work is ordered through performance based tasks or delivery orders
  - Task/Delivery Orders will be issued under the contracts on a cost reimbursement or fixed-price basis

Anticipated Procurement Strategies For ISE Support (cont'd)

- **Benefits of IDIQ Contracts:**
  - Flexibility – Cost Reimbursement and Fixed-Price Orders
  - Government does not commit itself for more than a minimum quantity
  - Each NASA Center may issue, fund, and administer its own individual delivery order/task order (LaRC retains over-all administration responsibility at the contract level)
  - Facilitates Consolidated Contracting Initiative (i.e., contracts available for multiple center use; reduces SEB activities)
- **Simplified Acquisitions Used for Low Dollar Non-Recurring Requirements < $100K**

Integration and Operations - Summary

Integration of the NASA ISE Initiative as an operational part of the national effort is recognized as a key challenge.

The ISE Initiative Office intends to develop partnerships that enable benefiting from the total national investment in related fields

Strategies, partnerships, and joint activities which can produce commercially viable software products applicable to NASA and other users will be pursued

A variety of acquisition/procurement strategies will be pursued, depending on the nature of the procurement. Flexibility and option capability is desired.

ISE Office POC's

Intelligent Synthesis Environment Industry/Academia Workshop

• Dr. John Malone	(757) 864-8988	j.b.malone@larc.nasa.gov
• Dr. Jerry Housner	(757) 864-2906	j.m.housner@larc.nasa.gov
• Brantley Hanks	(757) 864-4322	b.r.hanks@larc.nasa.gov
• John Peterson	(818) 354-9855	john.peterson@jpl.nasa.gov
• Dr. Dave Korsmeyer	(650) 604-3114	dkorsmeyer@arc.nasa.gov
• Beth Plentovich	(757) 864-2857	e.b.plentovich@larc.nasa.gov
• Dr. Dale Thomas	(256) 544-1180	dale.thomas@msfc.nasa.gov
• Arlene Moore	(757) 864-4407	a.a.moore@larc.nasa.gov
• Kelley Cyr	281 483-6818	kelley.j.cyr1@jsc.nasa.gov
• Ronnie Gillian	(757) 864-2918	r.e.gillian@larc.nasa.gov
• Dr. Austin Evans	(216) 433-5188	thevans@lerc.nasa.gov
• Douglas Craig	(757) 864-7008	d.a.craig@larc.nasa.gov
• Donald Monell	(757) 864-7515	d.w.monell@larc.nasa.gov
• Michelle Garn	(757) 864-1600	m.a.garn@larc.nasa.gov
• Randall Seftas	(301) 286-3131	rseftas@pop500.gsfc.nasa.gov
• Patrick Simpkins	(407) 861-3868	patrick.simpkins-1@ksc.nasa.gov
• Kajal Gupta	(661) 258-3710	kajal.gupta@mail.drfc.nasa.gov